METHOD AND APPARATUS FOR IMPROVED ORTHODONTIC BRACKET AND ARCH WIRE TECHNIQUE

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Related U.S. Application Data


References Cited

UNITED STATES PATENTS
2,908,974 10/1959 Stifter
3,345,745 10/1967 Muller

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ABSTRACT

The method and apparatus for improving orthodontic bracket and arch wire technique where the individual brackets have an inner radius for attachment to a tooth band which conforms to the outer contour of the tooth both vertically and horizontally and has at least one groove therein for the reception of one or more arch wires having a radius for conforming to overall arch wire geometry and wherein the groove is cut with a torquing angle, a tipping angle, an in-out dimension and in some cases, a rotation compensation angle for cooperation with an unbent arch wire in which the various angles built into the bracket result in desired force vectors for movement of individual teeth to a desired position, and in the alternative the variations in dimensions and angles are built into the tooth band.

30 Claims, 28 Drawing Figures
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1. METHOD AND APPARATUS FOR IMPROVED ORTHODONTIC BRACKET AND ARCH WIRE TECHNIQUE

RELATED APPLICATIONS

This application is a continuation-in-part of my co-pending application filed Sept. 22, 1967, Ser. No. 669,919, and now U.S. Pat. No. 3,477,128 issued Nov. 11, 1969, for Method and Apparatus for Improved Orthodontic Bracket and Arch Wire Technique.

DESCRIPTION OF THE INVENTION

The present invention relates to a method and apparatus for improved orthodontic bracket and arch wire technique and more particularly to a method and apparatus for an improved orthodontic bracket and arch wire technique in which force vectors are built into the individual orthodontic brackets or tooth bands for obviating the necessity of placing bends in the arch wire to produce the desired force vectors and, hence, the desired tooth movement.

PRIOR ART

The prior art method of installing orthodontic brackets and arch wires comprise basically the placement of brackets on bands which are placed on the patient's teeth, each bracket having a groove built therein for the reception of the arch wire. The orthodontist would then mount the arch wire in the individual bracket grooves and place bends in the arch wire which would result in various force vectors for moving the individual teeth to their desired positions. These force vectors are required for tipping the teeth toward or away from the adjacent teeth. Torquing the teeth, i.e., angulating them toward or away from the center of the mouth was accomplished by placing a twist in the arch wire along its longitudinal axis and moving the teeth in and out parallel to themselves toward the center or away from the center of the mouth and forward and back in dental arch. Other required or desired force vectors would be, as in the case of extractions, compensation for tooth rotation resulting in an attempt to move the tooth toward or away from another tooth and tip compensation to avoid the tooth tipping as it is moved toward or away from adjacent teeth. Other considerations involved in making these complex bends in the arch wire would be the compensations for the haphazard mounting of the brackets due to the outer contour of the tooth in two directions, i.e., horizontally and vertically, and general arch wire geometry. As can be appreciated, these complex vectors resulted at best in an approximation of the proper bends to be placed in the wire and depended a great deal on the individual orthodontic skill, dexterity and experience of the operator. This problem is magnified in the case of a partnership practice since few operators have sufficiently identical techniques to maintain a continuity of movement where succeeding arch wires are installed by different operators. This, of course caused considerable jiggling of teeth, i.e., partial retracing of previous movement together with the disadvantages attendant therewith, such as root resorption.

BACKGROUND OF THE INVENTION

According to the invention, the bracket or tooth band for each individual tooth has a plurality of dimensions built in, which, when coupled to an unbent arch wire, result in the desired force vectors being applied to the tooth. At the present time, there are a total of eight dimensions being taken into consideration. The first two to be considered is the curvature on the band side of the bracket which consists of two radii at right angles to each other, taking into consideration the outer contour of the individual tooth since this varies from tooth to tooth, e.g., from the central incisor to a molar. This contour consideration gives meaning to the other built-in force vectors since it supplies a consistent starting point. The prior art haphazard mounting of the bracket to the band results in the absence of this consideration.

2. The next dimension takes into consideration the arch wire geometry, i.e., the radius of curvature of the arch wire at the point of contact with the individual bracket. The other angles are built into the groove which receives the arch wire or to the tooth band. These angles result in torqueing, and tipping forces, and an in-out force. In the extraction case, tip compensation and rotation compensation angles are also built into the arch wire grooves or tooth band. Relative thickness of the bracket from the tooth to the inner face of the groove determines the in-out force.

It has been found that at least 90 percent of the malocclusions fall into three basic types which can be accommodated by nine basic sets of appliances. These can be subdivided into finer sets taking into consideration extraction and non-extraction cases. With these basic sets, a saving of from 15 to 75 minutes for each arch wire installation is made by each orthodontist, as well as an improved result by removing the guess work from the installation of the brackets and bands because the built-in angles in the brackets or bands predetermine their final arrangement.

An object of the present invention is the provision of a method and apparatus for an improved orthodontic bracket and arch wire technique.

Another object is to provide a method and apparatus for improved orthodontic bracket and arch wire technique for providing uniform results regardless of individual skill.

A further object of the invention is the provision of the method and apparatus for improved orthodontic bracket and arch wire technique which is faster and more uniform in results.

Still another object is to provide a method and apparatus for improved orthodontic bracket and arch wire technique having desired force vectors built into the orthodontic bracket or tooth band.

Yet another object is to provide a method and apparatus for an improved orthodontic bracket and arch wire technique which obviates or minimizes the necessity of placing bends in the arch wire.

Other objects and many of the attendant advantages will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a front elevation view of a typical prior art orthodontic bracket and arch wire installation;

FIG. 2 is a front elevation view of a typical installation of the orthodontic bracket and arch wire technique of the present invention;

FIG. 3 is a top view of a typical prior art orthodontic bracket and arch wire installation;

FIG. 4 is a top view of a typical installation of the orthodontic bracket and arch wire technique of the present invention;

FIG. 5 is a perspective view of the preferred embodiment of a typical orthodontic bracket according to the present invention;

FIG. 6 is a top view showing a schematic representation of a typical orthodontic bracket and arch wire installation according to the present invention;

FIG. 7 is a top view showing a schematic representation of the present invention as applied to an extraction case; and,

FIGS. 8-19 show various views of orthodontic brackets according to the present invention having various corrective force vectors built in as applied to different teeth in a typical case;

FIGS. 20-28 illustrate various views of tooth bands according to the present invention, having various corrective force vectors built in as applied to different teeth in a typical case.

Referring to FIGS. 1 and 3, a plurality of teeth is shown each having a tooth band 22 mounted thereon to which an orthodontic bracket 23 is attached. Each orthodontic bracket 23 has a groove which receives arch wire 25. Arch wire 25 has a plurality of bends 26.
Referring to FIGS. 2 and 4, a plurality of teeth 21 is again shown each carrying a tooth band 22. An orthodontic bracket 24 is attached to each tooth band. Each orthodontic bracket 24 has grooves with built-in angles substantially parallel to effect passage of an unbent arch wire 25, 25B and 25C therein.

Referring to FIG. 3, an orthodontic bracket 24 has arch wire grooves 51, 52 and 53 with a back portion 28 adapted to conform to the contour of a tooth band.

Referring to FIG. 6, a typical patient's mouth is shown having central incisors 31, lateral incisors 32, cuspsids 33, first bicuspids 34, second bicuspids 35, first molars 36 and second molars 37. Each of these teeth has an orthodontic bracket 24 attached thereto (by a tooth band not shown). Each of said orthodontic brackets 24 has grooves for receiving arch wires 25 and 25B therein.

Referring to FIG. 7, an extraction case is illustrated wherein a space generally shown at 41 is to be filled by tooth 42 by moving it parallel to itself toward tooth 43. Here bracket 24 has an angle E built in which compensates for rotation in the direction of arrow 44 and accomplishes a movement of the tooth 42 linearly in the direction of arrow 46. A tipping compensation angle B or B' (FIGS. 10, 16, 12 and 18) would also be utilized.

Referring to FIGS. 8–13, typical angles, radii and dimensions are shown on brackets 24 for a patient's right upper teeth. These angles are shown as A, A', B, B' and D. The radii are shown as R, R' and R'' and one critical dimension is shown as C (FIG. 11).

Referring to FIGS. 14–19, a group of orthodontic brackets 24 are shown for the left upper teeth complementing the set shown and described with reference to FIGS. 6–11. Again, angles A, A', B, B' and D are shown together with radii R, R' and dimension C (FIG. 17).

Angles A and A' represent torquing angles, B and B' represent tipping angles and dimension C results in an in-out force vector. Radii R and R'' correspond to the outer contour of the tooth and are at right angles to each other. Radius R' conforms to the radius of curvature of the arch wire geometry at that point. The following chart tabulates typical dimensions and angles for a set of these brackets, where dimensions C, R, R' and R'' are in inches and angles A, A', B, B' and D are in degrees. The dimensions and angles shown cover upper and left lower set. The left upper and right lower would have the same figures but would constitute a mirror image of the right upper and left lower.

The angles would apply to all of the grooves in the brackets, i.e., front grooves 51, top grooves 52, and bottom grooves 53. It is pointed out that in orthodontic arch wire techniques as set out in this application, it is contemplated that top or bottom grooves 52 or 53 would be utilized either alone or in conjunction with front groove 51. Where front groove 51 is not utilized, the in-out dimension and resulting force is determined by the distance from the inner side of the top and/or bottom groove 52 or 53 and the tooth. It will be seen below this can be varied by varying the dimensions of the bracket and/or modifications to the tooth band.

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<table>
<thead>
<tr>
<th>Right upper:</th>
<th>A</th>
<th>A'</th>
<th>B</th>
<th>B'</th>
<th>C</th>
<th>R</th>
<th>R'</th>
<th>R''</th>
<th>D</th>
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<td>0</td>
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<td>1.0</td>
<td>0.25</td>
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<table>
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<tr>
<th>Left lower:</th>
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<th>R</th>
<th>R'</th>
<th>R''</th>
<th>D</th>
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the outer face of at least one of said brackets and the back side of said at least one of said brackets are angularly displaced a predetermined amount in a horizontal plane for creating a rotating angle force vector on a predetermined tooth from an installed but unbent arch wire.

8. A set of orthodontic brackets comprising:

a plurality of brackets each having a front face and a back side;
said front face having a groove recessed therein for the reception of an arch wire, said grooves having predetermined depth and angulation for creating force vectors operable for straightening teeth of a patient upon installation of an unbent arch wire thereon; and
said back side being adapted for mounting to a predetermined tooth, the distance from said back side to the outer face of said bracket conforming to overall curvature of an installed but unbent arch wire geometry.

9. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth.

10. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
said grooves have a radius of curvature substantially equal to a predetermined radius of curvature of an unbent arch wire after the complete installation thereof.

11. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
at least one of said grooves has a vertical angle with respect to an axis of a predetermined tooth for creating a predetermined force vector for tipping said predetermined tooth a predetermined amount after the installation of an unbent arch wire.

12. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
the distance from said back side to the inner face of at least one of said grooves is predetermined to create a predetermined in-out force vector from completely installed but unbent arch wire on a predetermined tooth.

13. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
the outer face of at least one of said brackets and the back side of said at least one of said brackets are angularly displaced a predetermined amount in a vertical plane for creating a predetermined torqueing angle force vector on a predetermined tooth from a completely installed but unbent arch wire.

14. The set of orthodontic brackets of claim 8 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
the outer face of at least one of said brackets and the back side of said at least one of said brackets are angularly displaced a predetermined amount in a horizontal plane for creating a rotating angle force vector on a predetermined tooth from a completely installed but unbent arch wire.

15. A set of orthodontic brackets comprising:
a plurality of brackets having a front face and a back side and top and bottom sides;
said back side being adapted for mounting to a predetermined tooth having a specific contour, said back side being specifically contoured for cooperation therewith; and
one of said top and bottom sides having a groove recessed therein for the reception of an arch wire, said grooves having predetermined depth and angulation for creating force vectors operable for straightening teeth of a patient upon installation of an unbent arch wire thereon; and the distance from said back side to the outer face of said bracket conforms to overall curvature of an installed but unbent arch wire geometry.

16. The set of orthodontic brackets of claim 15 wherein:
each of said grooves has a radius of curvature substantially equal to a predetermined radius of curvature of an unbent arch wire after the complete installation thereof.

17. The set of orthodontic brackets of claim 15 wherein:
at least one of said grooves has a vertical angle with respect to an axis of a predetermined tooth for creating a predetermined force vector for tipping said predetermined tooth a predetermined amount upon installation of an unbent arch wire.

18. The set of orthodontic brackets of claim 15 wherein:
the distance from said back side to the inner face of at least one of said groove is predetermined to create a predetermined in-out force vector from an installed but unbent arch wire on a predetermined tooth.

19. The set of orthodontic brackets of claim 15 wherein:
the inner face of at least one of said grooves and the back side of at least one of said brackets are angularly displaced a predetermined torqueing angle force vector on a predetermined tooth from an installed but unbent arch wire.

20. The set of orthodontic brackets of claim 15 wherein:
the inner face of at least one of said grooves and the back side of at least one of said brackets are angularly displaced a predetermined amount in a horizontal plane for creating a rotating angle force vector on a predetermined tooth from an installed but unbent arch wire.

21. A set of orthodontic brackets comprising:
a plurality of brackets having a front face and a back side and top bottom sides;
one of said top and bottom side having a groove recessed therein for the reception of an arch wire, said grooves having predetermined depth and angulation for creating force vectors operable for straightening teeth of a patient upon installation of an unbent arch wire thereon; and
said back side being adapted for mounting to a predetermined tooth, the distance from said back side of the bracket to the inner face of said groove conforming to overall curvature of an installed but unbent arch wire geometry.

22. The set of orthodontic brackets of claim 21 wherein:
each of said back sides is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
said grooves have a radius of curvature substantially equal to a predetermined radius of curvature of an unbent arch wire after the complete installation thereof.

23. The set of orthodontic brackets of claim 21 wherein:
said back side is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
at least one of said grooves has a vertical angle with respect to an axis of a predetermined tooth for creating a predetermined force vector for tipping said predetermined tooth a predetermined amount after the installation of an unbent arch wire.

24. The set of orthodontic brackets of claim 21 wherein:
said back side is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
the distance from said back side to the inner face of at least one of said grooves is predetermined to create a predetermined in-out force vector from a completely installed but unbent arch wire on a predetermined tooth.

25. The set of orthodontic brackets of claim 19 wherein:
said back side is specifically contoured for cooperation with a predetermined tooth having a specific contour; and
the inner face of at least one of said grooves and the back side of at least one of said brackets are angularly displaced a predetermined amount in a vertical plane for creating a predetermined torquing angle force vector on a predetermined tooth from a completely installed but unbent arch wire.

26. The set of orthodontic brackets of claim 21 wherein: said back side is specifically contoured for cooperation with a predetermined tooth having a specific contour; and the inner face of at least one of said grooves and the back side of at least one of said brackets are angularly displaced a predetermined amount in a horizontal plane for creating a rotating angle force vector on a predetermined tooth from a completely installed but unbent arch wire.

27. An orthodontic bracket and tooth band combination comprising:
a tooth band adapted for attachment to a tooth;
a bracket adapted for attachment to said tooth band and having a groove recessed therein for the reception of an arch wire;
said tooth band including means for varying the distance from said tooth to the inner face of said groove to conform to overall curvature of an installed but unbent arch wire geometry.

28. The orthodontic bracket of claim 27 wherein: said means has a vertical angle with respect to an axis of a predetermined tooth for creating a predetermined force vector for tipping said predetermined tooth a predetermined amount after the installation of an unbent arch wire.

29. The orthodontic bracket of claim 27 wherein: the outer face of said means and the axis of said tooth are angularly displaced a predetermined amount in a vertical plane for creating a predetermined torquing angle force vector on a predetermined tooth from a completely installed but unbent arch wire.

30. The orthodontic bracket of claim 27 wherein: the outer face of said means and the axis of said tooth are angularly displaced a predetermined amount in a horizontal plane for creating a rotating angle force vector on a predetermined tooth from a completely installed but unbent arch wire.
Disclaimer


The term of this patent subsequent to Nov. 11, 1986, has been disclaimed.

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